

**EPA Superfund  
Record of Decision:**

**OAK RIDGE RESERVATION (USDOE)  
EPA ID: TN1890090003  
OU 20  
OAK RIDGE, TN  
01/23/1997**

<IMG SRC 971890>  
<IMG SRC 97189A>  
DOE/OR/02-1435&D2

**Record of Decision  
for  
Bear Creek Valley Operable Unit 2  
(Spoil Area 1 and SY-200 Yard)  
at the Oak Ridge Y-12 Plant,  
Oak Ridge, Tennessee**

Date Issued-September 1996

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Prepared for  
U.S. Department of Energy  
Office of Environmental Restoration and Waste Management

**PREFACE**

This Record of Decision for Bear Creek Valley Operable Unit 2 (Spoil Area 1 and SY-200 Yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee (DOE/OR/02-1435&D2) was prepared in accordance with requirements under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 to document the selected remedy. This work was performed under Work Breakdown Structure 1.4.12.1.1.02 (Activity Data Sheet 2302, "Bear Creek Valley"). Publication of the D2 version of this document will meet a Federal Facility Agreement milestone. This document is based on information provided in the Feasibility Study for the Y-12 Bear Creek Valley Operable Unit 2 Spoil Area 1, SY-200 Yard, and Rust Spoil Area, Oak Ridge, Tennessee (DOE/OR/02-1279&D2).

## ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
Ba	barium
Be	beryllium
bls	below land surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
Cd	cadmium
CFR	Code of Federal Regulations
Co	cobalt
Cr	chromium
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FR	Federal Register
FS	feasibility study
ft	foot
ha	hectare
Hg	mercury
in.	inch
kg	kilogram
km	kilometer
L	liter
m	meter
MCL	maximum contaminant level
Ig	microgram
mg	milligram
Mn	manganese
mrem	millirem
NCP	National Oil and Hazardous Substances Contingency Plan
Ni	nickel
NPL	National Priorities List
NTS	Nevada Test Site
O&M	operation and maintenance
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
OU	operable unit
PAH	polyaromatic hydrocarbon
Pb	lead
PCB	polychlorinated biphenyl
Ra	radium
RI	remedial investigation
ROD	record of decision
Sb	antimony
SVOC	semivolatile organic compound
TBC	to be considered
TDEC	Tennessee Department of Environment and Conservation
U	uranium
V	vanadium
VOC	volatile organic compound
yd	yard

## **PART 1. DECLARATION**

### **SITE NAME AND LOCATION**

U.S. Department of Energy  
Oak Ridge Y-12 Plant Bear Creek Valley Operable Unit 2  
Oak Ridge Reservation  
Oak Ridge, Tennessee

### **STATEMENT OF BASIS AND PURPOSE**

This record of decision (ROD) selects the remedial action for the Oak Ridge Y-12 Plant Bear Creek Valley Operable Unit (OU) 2 in Oak Ridge, Tennessee, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 and, to the extent practicable, the National Oil and Hazardous Substances Contingency Plan (NCP). This ROD provides background information on the site, outlines the technical goals of the remedy, summarizes the analysis of potential remediation alternatives, explains the rationale for the selected remedy, and certifies that the remedy complies with CERCLA. Implementation of the selected remedy will ensure that human health and the environment are protected from exposure to contaminants at Bear Creek Valley OU 2.

The remedial action decision is based on the administrative record for the Y-12 Plant Bear Creek Valley OU 2, including the remedial investigation (RI) (DOE 1995a), the feasibility study (FS) (DOE 1995b), the proposed plan (DOE 1995c), and other documents contained in the administrative record file for this site.

This document is issued by the U.S. Department of Energy (DOE) as the lead agency. The U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC) are supportive agencies as parties of the Federal Facility Agreement for this response action, and they concur with the selected remedy.

### **ASSESSMENT OF THE SITE**

Releases from this site or exposure to the hazardous media would present unacceptable risks to human health and the environment if the response action selected in this ROD is not implemented.

### **DECLARATION STATEMENT**

The primary objective of this remedial action is to mitigate risks to human health and the environment from exposure to contaminated soil and waste. Low levels of metals, organic compounds, and radionuclides were detected in soil at the OU 2 sites: Spoil Area 1 and the SY-200 Yard. The selected remedy for Spoil Area 1 and the SY-200 Yard addresses the principal threats at the sites by maintaining the existing waste covers and implementing specific access and use restrictions. Access and use restrictions will prevent unacceptable exposure to the contaminants. Deed restrictions will be implemented to restrict construction that could negatively impact the integrity of the covers at the sites and prohibit waste intrusion. Restrictions will also require incorporation of indoor radon mitigative measures in accordance with EPA guidelines for any future structure built on site. The site will be designated as a restricted industrial use area. Groundwater and surface water/sediment monitoring will be deferred to the Bear Creek Valley OU ROD scheduled for approval in Fiscal Year 1999. Major components of the selected remedy include the following:

- physical barriers (fences, gates, and signs) to limit access to the site;
- deed restrictions to restrict construction at the sites and prohibit waste intrusion to mitigate direct exposure; and
- periodic physical surveillance of the soil cover and other features of the site and maintenance or repair, as required.

#### **STATUTORY DETERMINATIONS**

The selected remedy protects human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The selected remedy provides the best balance of tradeoffs in terms of the nine CERCLA criteria for evaluation. The risk reduction provided by treatment is not commensurate with additional costs. Therefore, this remedy does not satisfy the statutory preference under CERCLA 121(b) for treatment to reduce the toxicity, mobility, or volume of contaminants. Because this remedy will not result in the removal of hazardous substances present above health-based risk levels from the site, a 5-year review will be conducted after completion of remedial action to ensure that the remedy continues to protect human health and the environment.

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## **PART 2. DECISION SUMMARY**

### **SITE NAME, LOCATION, AND DESCRIPTION**

The DOE Oak Ridge Reservation (ORR) is in Anderson and Roane Counties near the city of Oak Ridge in eastern Tennessee. Figure 2.1 shows the city's location, approximately 32 km (20 miles) northwest of Knoxville, Tennessee. The reservation, 14,300 ha (35,300 acres) of federally owned land, houses the Oak Ridge K-25 Site, the Oak Ridge National Laboratory (ORNL), and the Y-12 Plant.

The Y-12 Plant encompasses approximately 320 ha (800 acres) and is adjacent to the corporate center of the city of Oak Ridge. The plant occupies Bear Creek Valley between Chestnut Ridge to the south and Pine Ridge to the north of the plant.

The Bear Creek Valley OU 2 (see Fig. 2.1) is in Bear Creek Valley near the headwaters of Bear Creek immediately west of the Y-12 Plant's main facilities. Bear Creek Valley OU 2 is comprised of a former construction spoil area, Spoil Area 1, and a former construction storage yard, the SY-200 Yard.

The surface water system in the area is comprised of Bear Creek and its tributaries. Bear Creek runs parallel to the SY-200 Yard. An intermittent stream, located on the eastern edge of the SY-200 Yard, flows north to Bear Creek. Spoil Area 1 includes a drainage ditch on its eastern side. Drainage Ditch A is the only surface water feature located in Spoil Area 1.

### **SITE HISTORY AND ENFORCEMENT ACTIVITIES**

On November 21, 1989, EPA placed ORR on the National Priorities List (NPL) under CERCLA. On January 1, 1992, a Federal Facility Agreement was implemented by DOE, EPA, and TDEC. The agreement provides a procedural framework and schedule for evaluating, prioritizing, and managing areas of contamination on ORR. The agreement specifies that CERCLA procedures be followed to evaluate and remediate contamination problems. Work at Spoil Area 1 began as a Resource Conservation and Recovery Act of 1976 facility investigation before the site was listed on the NPL. However, further work has been conducted under CERCLA.

Originally constructed as part of the Manhattan Project in the early 1940s, the Y-12 Plant has developed into a highly sophisticated manufacturing and developmental engineering facility. Manufacturing activities at the Y-12 Plant included chemical processing and engineering. In support of these activities, disposal areas for uncontaminated fill and construction debris (Spoil Area 1) and for the temporary, aboveground storage of equipment (the SY-200 Yard) were established.

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#### **SPOIL AREA 1**

Spoil Area 1 is west of the Y-12 Plant on Old Bear Creek Road. Various renovation, maintenance, and construction operations at the Y-12 Plant produced construction debris, which included concrete, asphalt, brick, brush, rock, and tile. Solid waste (spoil material) generated during these operations was disposed of in Spoil Area 1 from 1980 to 1985. A soil cover was placed over Spoil Area 1 in 1985.

Spoil Area 1 is a Class IV landfill, permitted by TDEC (permit number DNL-01-103-0012) for the disposal of construction and demolition waste. No spoil material was received by the unit for approximately 5 years after 1985. However, the volume of waste placed at the unit had exceeded

the landfill limit by 8,946 m<sup>3</sup> (11,700 yd<sup>3</sup>). TDEC was notified in 1991 of the overfilled condition.

#### SY-200 YARD

The SY-200 Yard is west of the Y-12 Plant on Old Bear Creek Road between Spoil Area 1 and the Rust Spoil Area. From the 1950s to 1986, the SY-200 Yard was an aboveground storage facility for machinery and miscellaneous items. No chemicals or waste materials were stored at the site, and all containers (e.g., tanks) at the site were empty and stored for future use. The site was surrounded by a 1.8-m (6-ft) fence with gate access. The operation divisions that used the yard included the Y-12 Plant Assembly Division, Engineering Technology Division, Metal Preparation Division, and the ORNL Fusion Energy Division. Items stored at the site were segregated with respect to ownership by the various operating divisions using the yard. After the presence of visible mercury was detected on the SY-200 Yard, a soil cover of 0.9-1.7 m (3-5 ft) was placed at the site.

#### HIGHLIGHTS OF COMMUNITY PARTICIPATION

The proposed plan for the Y-12 Bear Creek Valley OU 2 (DOE 1995c) was issued in August 1995. The proposed plan and other supporting documents for Bear Creek Valley OU 2, such as the RI and FS are available to the public in the Administrative Record File at the DOE Information Resource Center. DOE published a notice of availability regarding the project in The Oak Ridger and the Knoxville News-Sentinel newspapers on October 18, 1995. The public comment period was set from October 18 through November 17, 1995. In the notice, the public was offered the opportunity to request a public meeting, but none was requested. Because no public comments were received, the selected remedy has not been modified, and DOE has determined that the actions suggested in the proposed plan are justified.

#### SCOPE AND ROLE OF THE SITE

Bear Creek Valley OU 2 originally included three sites (Rust Spoil Area, Spoil Area 1, and SY-200 Yard). The Rust Spoil Area was removed from OU 2 because it appears to contribute to groundwater contamination. The Rust Spoil Area and underlying groundwater will be addressed as part of the overall Bear Creek Valley OU, which includes all groundwater for the valley.

The remaining OU 2 sites, Spoil Area 1 and SY-200 Yard, do not contribute to groundwater contamination. The site risks are associated with direct exposure to contaminated soil and waste. This risk is mitigated through the selected remedy. Bear Creek Valley OU will address the remaining source units in the valley and issues related to groundwater and surface water. Therefore, actions taken through the selected remedy for OU 2 are justified and consistent with the strategy for addressing principal threats posed by sources in the Bear Creek Valley OU.

Spoil Area 1 is a 2-ha (5-acre) site that received construction debris from 1980 until 1985, at which time a 0.61-m (2-ft) minimum soil cover was placed over the site.

The SY-200 Yard was used from the 1950s until 1986 to temporarily store equipment. After the stored equipment was removed in 1986, mercury was discovered during the construction of an environmental support facility at the site. Construction stopped and the site was covered with 0.9-1.7 m (3-5 ft) of clean soil.

#### SUMMARY OF SITE CHARACTERISTICS

During the RI, soil, surface water, sediment, and groundwater were sampled and analyzed for contamination. Most compounds were near background levels.

## SPOIL AREA 1

Nature and Extent of Contamination. Subsurface soil samples were taken from six soil borings at Spoil Area 1. Soil borings were constructed through the fill material and into the native underlying soil. Samples were not taken of the clean cover, but were taken throughout the fill material at 1.2-m (4-ft) intervals and once in the native soil. Samples were analyzed for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), inorganic contaminants, and radiological parameters. A comparison of historical sample data indicated that 57 analytes were present above background levels. Those constituents that were not laboratory contaminants (are not necessary nutrients) and were detected more than once include metals (Ba, Be, Cd, Co, Hg, Cr, and Mn), SVOCs, and radionuclides (total uranium and radium). Metals that were detected did not provide evidence of spatial trends of distribution. Most analytes were only slightly above background. Constituents that significantly exceeded background levels are beryllium, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, and 226 Ra. Waste disposal records for the site were reviewed to identify a potential source of radium, but no records concerning radium were found.

Constituents in the small, intermittent seep at Spoil Area 1 above background include Sb, Pb, Co, V, Hg, and Ni. Mercury was the only constituent in an unfiltered sample to exceed the maximum contaminant level (MCL). However, mercury was not detected in the filtered sample.

Three metals were detected in surface water samples. Iron and aluminum were detected, but these metals are naturally occurring and essential nutrients. Small concentrations of antimony were also detected. The detected contaminant concentrations were all below risk-based levels.

Groundwater at Spoil Area 1 contained acetone and tetrachloroethene, 1,2-dichloroethene, and trichloroethene. This suite of contaminants is characteristic of the groundwater plume emanating from the nearby S-3 site. The lack of soil contamination and the similarity of contaminant types to other nearby contaminant plumes indicate that Spoil Area 1 is not a likely source for the VOC groundwater contamination at this site.

Contaminant Fate and Transport. Metal contaminants such as beryllium that are migrating from the fill material at Spoil Area 1 are being adsorbed in the underlying native soil residuum. This process of adsorption has essentially eliminated the transport of contaminants into groundwater. In addition, the SVOCs detected are characterized by relatively low volatility and low solubility in water. The SVOCs are expected to be relatively immobile in the soil and to remain partitioned in the fill and debris of the landfill.

The presence of radium indicates that radon will be formed. The release of radon and subsequent decay products could result in potential exposure via inhalation if a hypothetical enclosed structure allows sufficient buildup of decay products. Therefore, the air medium represents a migration pathway for small amounts of radon, a decay product of radium. In general, polycyclic aromatic hydrocarbons (PAHs) released to the soil are expected to adsorb very strongly to the soil and are not expected to leach below the top few inches of soil. The ultimate fate of PAHs is biodegradation and biotransformation by benthic organisms.

## SY-200 YARD

Nature and Extent of Contamination. Sampling before the RI had consisted of three sampling events: July 1986, January 1988, and January 1989. Six samples were collected in July 1986. The majority of the 59 soil borings sampled during the RI were on the eastern and western portions of the site where historical information indicated contaminants would most likely be present. Because historical data indicated that at least 0.9 m (3 ft) of clean fill covered the site, sampling began at 0.9 m (3 ft) below the surface. Of the 65 analytes identified as



above background, only beryllium, mercury, Aroclor-1254, Aroclor-1260, and benzo(a)pyrene significantly exceeded background levels.

Mercury was detected to a concentration of 816 mg/kg, and free mercury was seen in some of the borings. Delineation of mercury contamination is difficult because the analysis of samples containing visible mercury did not always indicate mercury. The reason visible mercury may not result in high analytical detections is that the mercury binds together to form visible nuggets. However, if those nuggets are not selected for analysis during sampling or when the analyzer selects a portion of the sample for analysis, the analytical results will not show visible mercury. However, mercury was primarily found above risk-based levels in the eastern and western portions of the site at 0.9-3.3 m (3-11 ft) bls.

Analytes detected in water samples taken from wet weather conveyances are compared to groundwater MCLs for screening purposes only and not to compare the water samples to any ARAR. Sampling indicated that aluminum and iron exceeded MCLs. Aluminum and iron are thought to be naturally occurring. The maximum total lead concentration of 5.7 Ig/L is below the TDEC action limit of 15 Ig/L, which is a guidance level used for groundwater usable for drinking water.

The RI included installation of shallow wells because the SY-200 Yard had no existing wells. During drilling, a perched water table was encountered in the fill material at 4-5-m (15-20-ft) depths. This perched water table was sampled and analyzed. No groundwater contamination was detected in wells in the SY-200 Yard. This lack of contamination is expected because the contaminants in the soil [mercury and polychlorinated biphenyls (PCBs)] are fairly insoluble and do not readily migrate into the underlying groundwater.

Contaminant Fate and Transport. The fate and transport of metals, such as beryllium, and SVOCs, such as benzo(a)pyrene, would be as described for Spoil Area 1. The data do not suggest that migration to groundwater has occurred. Mercury, PAHs, and PCBs have similar transport characteristics. Migration of contaminants from SY-200 Yard is not expected because of the low solubility of mercury and PCBs, the primary contaminants present. Future erosion of the soil cover and subsequent erosion of contaminants into Bear Creek is possible. Mercury is volatile and could be released to the air; however, migration of mercury through air is likely to be minimal.

The low water solubility of PCBs, their high octanol/water partition coefficient, and the strong adsorption to soils indicate that leaching should not occur in soil under most conditions. PCBs (represented at the SY-200 Yard by Aroclor-1254 and -1260) do not degrade in soil by any known chemical processes, degrade very slowly by biodegradation processes, and are largely comprised of higher chlorinated species that are resistant to biodegradation. Data support the limited migration potential of PCBs in that none were detected in the groundwater.

#### **SUMMARY OF SITE RISKS**

The risk assessment for the Bear Creek Valley OU 2 shows that soil poses a potential human health risk. Risk exposure for soil was calculated according to the baseline scenario, which assumes that all controls, fencing, and waste covers are not barriers to receptor exposure. Two exposure scenarios, an industrial worker scenario and a residential scenario, were evaluated in the risk assessment. Because of the location and current and projected future land use of OU 2, an industrial worker was evaluated as the most reasonable and most likely future receptor. In addition, a conservative estimate of risk to residential receptors was evaluated.

The exposure pathways evaluated for the land use scenarios for each OU 2 site included incidental ingestion of soil, inhalation of dust and VOCs, dermal contact with soil, and external exposure to radionuclides in the soil. Ingestion of homegrown vegetables and fruits

was also evaluated for the residential scenario.

The ecological risk assessment is based on Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual (EPA 1989). This assessment determines if and where adverse ecological effects to receptors other than humans and domestic animals occur as a result of exposure to contaminants from Bear Creek Valley OU 2 and whether remediation is needed.

Because of the semiquantitative nature of the characterization of biota and habitats at risk, the assessment of potential impacts to wildlife and vegetation from exposure to contaminants is based largely on toxicological effects reported in the literature for the contaminants of potential concern. Field measurements of contaminant concentrations and published toxicity data for terrestrial organisms allow for a quantitative estimate of risk using the ratio or quotient method. Because aquatic exposures in the source units are very limited, emphasis is given to terrestrial organisms at the Bear Creek Valley OU 2 units. Risks to aquatic communities will be evaluated as part of the RI for the overall Bear Creek Valley OU.

#### SPOIL AREA 1

##### Human Health Risks.

Only exposure to radium exceeded EPA's threshold risk of  $1 \times 10^{-4}$  for both exposure scenarios; however, Be, <sup>226</sup>Ra, <sup>238</sup>U, and benzo(a)pyrene exceeded an excess cancer risk of  $1 \times 10^{-4}$  for the residential scenario. The total risk for the industrial scenario is estimated at  $4.8 \times 10^{-4}$  ( $2.0 \times 10^{-6}$  without radium). The total risk for the residential scenario is estimated at  $1.1 \times 10^{-3}$  ( $1.0 \times 10^{-5}$  without radium). The garden scenario (not included in the total risk summary) contributed a risk of  $4.8 \times 10^{-4}$  and a hazard index of 20, where a hazard index greater than 1 implies the potential of inducing toxicological effects. The elevated risk is primarily from radionuclides such as uranium, and the elevated hazard index is primarily from manganese. Manganese is thought to be naturally occurring and not related to site activities.

##### Environmental Risks.

Spoil Area 1 is a grass-covered, terraced hillside bordered at the top by a forest. A small seep exists at the base of Spoil Area 1 beside a road. The primary exposure environment is the grassed soil surface and the underlying soil. Therefore, the contaminant sources examined include surface and subsurface soil. Contaminants of potential ecological concern at Spoil Area 1 include inorganics and organics. These contaminants were then evaluated against a set of screening benchmarks to determine the contaminants of ecological concern. After this secondary screening, manganese was found to be a contaminant of ecological concern for small mammals at Spoil Area 1.

#### SY-200 YARD

##### Human Health Risks.

The contaminant-specific risks are at or less than  $5 \times 10^{-6}$  with a total risk of  $2.9 \times 10^{-6}$  for the industrial scenario and  $2 \times 10^{-5}$  for the residential scenario (not including the garden scenario). Although no contaminants exceeded a hazard quotient of 1 (including mercury) on a sitewide basis, it was possible to identify limited areas contaminated with mercury. A risk assessment on those areas showed a hazard index of 1.6, slightly above EPA's threshold value of 1, for the residential scenario due to mercury. The garden scenario shows a risk of  $2 \times 10^{-3}$ , due primarily to <sup>238</sup>U, and a hazard index of 70, due primarily to mercury and manganese.

##### Environmental Risks.

The SY-200 Yard is a denuded and graded lot surrounded on three sides by open industrial areas and on the fourth side by a vegetated bank descending to Bear Creek. This sloping side of the lot is the primary exposure environment for ecological receptors at the SY-200 Yard, mostly from vegetation growing on and animals burrowing into contaminated soil. Because the surface soil is not contaminated, airborne dust is not an exposure pathway. Inorganic and organic compounds were considered as contaminants of potential concern. However, after the secondary screening against toxicity benchmarks, the only soil contaminants of concern at the SY-200 Yard were mercury for plants and manganese for small mammals.

## DESCRIPTION OF ALTERNATIVES

### RISK MANAGEMENT

In the FS, contaminants of concern targeted for remediation for Spoil Area 1 and SY-200 are 226 Ra and mercury, respectively. Other contaminants with an excess cancer risk between  $1 \times 10^{-6}$  and  $1 \times 10^{-4}$  for the site include beryllium and benzo(a)pyrene at Spoil Area 1 and benzo(a)pyrene, dibenzo(a,h)anthracene, and PCBs at SY-200 Yard. These contaminants are not targeted for remediation for several reasons. First PAHs, benzo(a)pyrene and dibenzo(a,h)anthracene, are found at very low levels throughout the Y-12 Plant and are not a significant health risk as shown in the baseline risk assessment. Remedial actions to control the targeted contaminants would partially address the PAHs and PCBs. Likewise, beryllium concentrations were higher than background levels but are considered attributable to native soils and not to the fill material at Spoil Area 1. PCBs detected during sampling are buried beneath several feet of clean soil, reducing the risk by several orders of magnitude.

### DEVELOPED ALTERNATIVES

The following alternatives were evaluated in the Bear Creek Valley OU 2 FS. In the FS, four alternatives were developed for Spoil Area 1, and five alternatives were developed for SY-200 Yard. The first four alternatives are very similar for both sites and are combined in the discussion below to avoid repetition. Alternative 2 is the selected remedy for both Spoil Area 1 and the SY-200 Yard and is discussed in more detail in the "Selected Remedy" section.

#### ALTERNATIVE 1-NO ACTION

The no action alternative would involve no remedial actions or restrictions to reduce the potential for exposure. Current controls and restrictions would no longer apply. DOE is required by NCP to include this alternative in the RI/FS selection process for comparison with other alternatives. The no action alternative can be selected if the assessment of risk in the RI shows no potential threat to human health or the environment or if active remediation is more harmful to human health and the environment than no action.

#### ALTERNATIVE 2-MAINTAIN EXISTING COVER AND INSTITUTIONAL CONTROLS

The primary intent of Alternative 2 is to maintain the existing soil cover for both sites while monitoring site conditions over time. Institutional controls, including physical barriers and deed restrictions, would be implemented to allow restricted industrial land use. Deed restrictions will be implemented to restrict construction that could negatively impact the integrity of the covers at the sites and prohibit waste intrusion. Restriction will also require incorporation of indoor radon mitigative measures in accordance with EPA guidelines for any structure built on site. Specific monitoring would be deferred until the Bear Creek Valley ROD (scheduled for approval in Fiscal Year 1999) is implemented. This monitoring plan will address all media, contaminants, and contaminant migration pathways significant to the watershed. Physical surveillance of the soil covers and other features of the site would be

performed periodically, and maintenance or repair would be performed as required.

#### ALTERNATIVE 3-CAPPING, INSTITUTIONAL CONTROLS, AND MONITORING

Alternative 3 includes the installation of clay caps over both waste areas and the collection of an intermittent seep at Spoil Area 1. A clay cap would provide a physical barrier between the buried waste and potential human and ecological receptors. For this alternative, no waste material would be removed. Institutional controls and monitoring would be implemented as discussed for Alternative 2.

For Spoil Area 1, a seep water collection system would be installed to minimize the buildup of shallow subsurface water beneath the cap. The collection system would consist of subsurface drains placed beneath the new clay cap as required. Collected water would be treated at a nearby water treatment facility.

#### ALTERNATIVE 4-SOIL REMOVAL AND DISPOSAL

Alternative 4 would achieve final remediation for both sites through removal of the contaminated soil and debris. Excavated waste would be disposed of at an appropriate disposal facility. Once the groundwater action is complete (under another OU), this alternative would allow unrestricted land use at both sites.

For Spoil Area 1, approximately 25,000 m<sup>3</sup> (33,000 yd<sup>3</sup>) of soil and debris would be excavated and disposed of at a new landfill cell at the Y-12 Plant. The new landfill cell would be an addition to an existing landfill. For the SY-200 Yard, approximately 5,700 m<sup>3</sup> (7,500 yd<sup>3</sup>) of waste would be removed and disposed of at the Nevada Test Site (NTS).

Any uncontaminated, excavated material would be stockpiled and used as backfill in the excavated areas. Sampling during remediation would provide for removal of all materials contaminated above EPA-accepted cleanup levels. The remediated areas would be backfilled with clean soil and revegetated after waste removal activities cease.

The major differences between actions for Alternative 4 at the two sites are the target contaminants (226 Ra at Spoil Area 1 and mercury at SY-200 Yard), the volume of contamination (much greater at Spoil Area 1), and the disposal locations.

#### ALTERNATIVE 5-MERCURY-CONTAMINATED SOIL REMOVAL, TREATMENT, AND REPLACEMENT

This alternative applies only to the SY-200 Yard. Mercury-contaminated soil would be removed from the SY-200 Yard, processed in a temporary, on-site treatment facility, and returned to the excavated areas. After treatment, no institutional controls would be needed, and the site could be released for unrestricted use.

The most likely treatment process would be mercury-roasting, which uses heat to remove mercury from excavated soil that has been preprocessed to reduce particle size. Treated soil would be cooled by a water spray and placed on the site. Treatment residuals would consist of small volumes of mercury-contaminated solids, sludges, and organic liquids. These residuals would be disposed of at existing Y-12 Plant facilities or at a commercial disposal facility.

After completing soil treatment, the treatment facility would be dismantled and removed, and the site would be revegetated.

## SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

CERCLA requires evaluation of nine criteria for comparing the expected performance of remedial actions. The nine criteria are identified below, and the remedial alternatives have been evaluated on the basis of these criteria.

### 1. Overall Protection of Human Health and the Environment

This criterion addresses an alternative's ability to provide adequate long- and short-term protection of human health and the environment. Alternative 1 would be the least protective in the long term. Alternatives 2 and 3 provide equal amounts of short term protection for the community and workers and of long-term protectiveness, although Alternative 3 provides the added reliability of an engineered cap. Alternatives 4 and 5 would provide the greatest long-term protection while increasing short-term risk to the community and workers.

Alternative 1, no action, would not protect human health because risks from exposure to contaminants at the site currently exceed acceptable levels. There would be the potential for increased harm to the environment, if no action were taken. Alternative 2 would protect humans from exposure to the materials by restricting access to the waste with institutional controls and protect the environment by maintaining the existing covers. Alternative 3 would also protect human health with institutional controls and the environment through the use of containment, with the added reliability of an engineered cap over the sites. Additionally, collecting seep water from Spoil Area 1 may limit future off-site migration of contaminants, although the existing seep is currently not posing an environmental risk. Alternative 4 would protect human health and the environment by removing the contaminated material and disposing of it elsewhere. However, short-term risks to communities along the transportation route would be slightly higher because of the potential for truck accidents. Alternative 5 would protect human health by removing the mercury from the soil through roasting, a treatment technology. Likewise, the final degree of protection would be comparable to the other action alternatives, but with enhanced reliability.

During remediation, all action alternatives would protect the community and workers through the use of engineered and institutional controls. Short-term risks to the community (not including transportation) and to nonremediation workers would be approximately equal and within acceptable limits for all four action alternatives. Air emission controls on the roaster for Alternative 5 would limit the release of mercury to the atmosphere.

### 2. Compliance with ARARs

This criterion addresses an alternative's ability to meet ARARs of all environmental federal and state statutes and regulations.

Alternatives 2 through 5 would comply with ARARs. No waivers are anticipated for any of the alternatives. The FS presents a comprehensive list of potential ARARs for all alternatives. A summary of ARARs for Alternative 2, the selected remedy, is presented in Table 2.1 and is discussed in the "Statutory Determinations" section.

### 3. Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to the magnitude of expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

Alternative 1 would be the least effective in the long term because of the potential for erosion

of the soil cover and subsequent waste migration off site. Alternatives 2 and 3 would be equally effective and permanent. The reliability of both a soil cover (Alternative 2) or a clay cap (Alternative 3) depends on the degree of maintenance received. Alternative 4 would be slightly more effective because stricter controls are placed on disposal areas, on and off site, than on industrial areas. Alternative 5 would be the most permanent for the SY-200 Yard because soil would be treated and mercury would be removed permanently from the site.

Long-term environmental effects are comparable among the alternatives. The site does not contain unique habitats. To some degree, irretrievable commitment of resources would result from implementation of any of the alternatives, except the no action alternative. Alternative 4 would result in the permanent commitment of space at both disposal sites. Alternatives 4 and 5 would use fuel and other nonrenewable energy sources during remediation and a small volume of treatment residuals would require disposal. Alternatives 2 and 3 would limit use of the sites because waste would remain in place. Alternative 3 would use clean clay for the clay caps as well as some fuel. Alternative 2 would use small amounts of fertilizer and fuel during maintenance actions.

Table 2.1. ARARs/TBC guidance for the selected remedy for Spoil Area 1 and SY-200 Yard, Bear Creek Valley Operable Unit 2, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee

Actions	Requirements	Prerequisites	Citation
Chemical-specific ARARs			
Control of radionuclide air emissions	Releases to the atmosphere must not exceed the NESHAP of 10 mrem/year	Emissions of radionuclides to ambient air from DOE facilities - applicable to emissions at Spoil Area 1	40 CFR 61.92
Protection of the public	The public must not receive an EDE greater than 100 mrem/year	Releases of radioactive material from all DOE activities - TBC for any releases at Spoil Area 1	DOE Order 5400.5 Chapter II.Ia
	All releases of radioactive material must be ALARA		DOE Order 5400.5 Chapter IV.2c
Location-specific ARARs-None			
Action-specific ARARs			
Maintain institutional controls	Maintain active controls including fences, warning signs, and restrictions on land use	Long-term management of residual radioactive material above guidance levels - TBC for Spoil Area 1	DOE Order 5400.5 Chapter IV.6c
	Maintain/implement the following institutional controls as necessary: land and water use restrictions, well-drilling prohibitions, building permits, and well use advisories and deed notices	Long-term management of residual contamination at a CERCLA site - TBC for Spoil Area 1 and SY-200 Yard	40 CFR 300.430(e)(3)(ii); 55 FR 3706
1200-1-13-.08(3)(a)4.(iv)	Maintain/implement institutional controls for all areas where containment is a remedial action; such controls include, at a minimum, deed restrictions for sale and use of property, and securing the area to prevent human contact with hazardous substances	Containment and long-term management of residual contamination at an inactive hazardous substance site - applicable for Spoil Area 1 and SY-200 Yard	TDEC

Table 2.1. (continued)

Actions	Requirements	Prerequisites	Citation
Closure with waste in place	<p>General performance standard</p> <p>Operator of a Class II or IV solid waste disposal facility must close the facility in a manner that:</p> <ul style="list-style-type: none"><li>• minimizes the need for further maintenance and controls, minimizes, or eliminates, to the extent necessary to prevent threats to public health and the environment, post-closure escape of solid waste, solid waste constituents, leachate, contaminated rainfall, or waste decomposition products to the ground or surface waters to the atmosphere</li></ul> <p>Operator of a Class II or IV solid waste disposal facility must not:</p> <ul style="list-style-type: none"><li>• contaminate an underground drinking water source or</li><li>• significantly limit the present or future uses of</li></ul> <p>groundwater underlying the area</p>	Closure of a permitted Class II or IV solid waste disposal facility-applicable for SA-1; relevant and appropriate for SY-200 Yard	<p>TDEC 1200-1-7-.04(8)(a)</p> <p>TDEC 1200-1-7-,04(7)(a)(1)(ii)</p> <p>TDEC 1200-1-7-,04(7)(a)(1)(ii)</p>

ALARA = as low as reasonably achievable  
DOE = U.S. Department of Energy  
TBC = to be considered  
ARAR = applicable or relevant and appropriate requirement  
EDE = errective dose equivalent  
TDEC = Tennessee Department of Environment and Conservation  
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980  
FR = Federal Register Conservation  
mrem = millirem  
CFR = Code of Federal Regulations  
NESHAP = National Emission Standards for Hazardous Air Pollutants



#### 4. Reduction of Contaminant Toxicity, Mobility, or Volume Through Treatment

Alternatives 3 and 5 are the only alternatives that include treatment. Alternative 5 would provide the greatest reduction in toxicity, mobility, and volume of contaminants.

Alternatives 2 and 4 do not include any treatment; therefore, there would be no reduction of toxicity, mobility, or volume as a result of treatment. Alternative 3 would collect and treat water from the intermittent seep. Treatment of the water would slightly reduce the volume of contamination through metals and radionuclide precipitation or through carbon adsorption. However, the actual reduction in toxicity, mobility, or volume from treatment would be minimal compared to the volume of contaminated soil at Spoil Area 1.

Alternative 5 would remediate by treatment. Roasting mercury-contaminated soil would result in a volume reduction of contaminated material. The mercury would be recovered in a concentrated residual or transferred onto carbon or other material used in the collection system. Although mercury would be removed from the environment, the benefit would be small because the mercury present (elemental) is in its least toxic and least mobile form.

#### 5. Short-Term Effectiveness and Environmental Impacts

This criterion considers impacts to the community, on-site workers, and the environment during construction and implementation until protection is achieved. The actions included in Alternative 4 would have the greatest impact on the community and workers. Alternative 5 would also impact workers. Alternatives 1, 2, and 3 would not disturb any waste and therefore would impact workers the least. Alternative 3, 4, and 5 would impact the environment and displace or destroy inhabitant species. Alternative 2 would have almost no effect on human health or the environment, either in the short or long term.

Alternative 1 would not involve any action; therefore, there would be no increase in short-term risks and no short-term environmental effects. The action alternatives would be approximately equally protective of the local community during implementation. Through the use of institutional controls, access to the work site would be controlled. Alternative 2 would have virtually no short-term environmental impact. Alternative 3 would likely increase the sediment loading in Bear Creek during placement of the cap. Alternatives 4 and 5 have the greatest environmental impacts because the waste would be disturbed and contaminants could migrate during construction. Transportation of excavated material in Alternative 4 could increase the risk to workers (on-site disposal for Spoil Area 1) or the community (off-site disposal for SY-200 Yard) because of the increase in risk from potential truck accidents.

Alternative 2 would require no time to implement. Alternatives 3 (for both sites) and 5 could be implemented in 4-6 months. Alternative 4 would take 3 years to implement for Spoil Area 1 and 4 months for the SY-200 Yard after resolution of administrative concerns, such as possible litigation and authorization to transport and dispose of waste from ORR.

#### 6. Implementability

Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution. Although there would be no insurmountable issues for any of the alternatives, Alternatives 4 and 5 would be the most difficult to implement because of site conditions, transportation restrictions, and administrative obstacles. Alternatives 1, 2, and 3 would be easier to implement because waste would not be disturbed.

There would be significant administrative issues concerning Alternative 4 for the SY-200 yard.

NTS does not have a contract in place to accept waste from ORR. It is uncertain if the states between Tennessee and Nevada would allow the material to be transported and if the state of Nevada would allow waste to be admitted into the state. The security requirements in the area of the rail-loading platform at the Y-12 Plant would require considerable planning and may slow remediation if access to workers is denied or shipments are inspected. Excavation and off-site disposal are technically feasible. However, any excavation would be difficult due to the presence of buried piles at the SY-200 Yard and the difficulty in sampling and analyzing for mercury in soils. The need to site a new construction debris landfill adds to the administrative difficulty of Alternative 4 for Spoil Area 1. The difference in administrative feasibility between Alternative 4 and the others is the most significant difference under CERCLA criteria.

Full-scale experience in roasting mercury-contaminated soils (Alternative 5) is limited. Uncertainties regarding the achievable, site-specific soil cleanup levels, the collection of air emissions, and the characterization of the waste residual may be reduced by treatability studies. Roasting is considered innovative, but implementable, because vendors exist that could provide and operate the system.

## 7. Cost

Cost estimates were prepared for each remedial alternative. The estimates are based on feasibility level scoping and are intended to aid in making alternative evaluations. The estimate is divided into capital cost and operation and maintenance (O&M) cost. All estimates have been escalated using DOE-approved escalation rates and a schedule for the various activities based on similar project experience. O&M cost includes routine surveillance, maintenance, and monitoring (if required by the alternative) for approximately 30 years. Monitoring would support the required CERCLA 5-year reviews.

Of the action alternatives, Alternative 4 costs the most to implement, based on present worth cost (see Table 2.2). Alternative 5 for the SY-200 Yard has similar costs to Alternative 4. The cost for implementing Alternative 3 is an order of magnitude less than Alternative 4. Alternative 2 is the least costly of the action alternatives and is significantly less than Alternative 3.

**Table 2.2. Present-worth cost (based on a 30-year present value) for remedial alternatives for Bear Creek Valley Operable Unit 2, V-12 Plant, Oak Ridge, Tennessee**

Alternative	Present-worth cost (\$)
• Alternative 1	No cost
• Alternative 2	
< Spoil Area 1	236,000
< SY-200 Yard	234,000
• Alternative 3	
< Spoil Area 1	3,400,000
< SY-200 Yard	1,200,000
• Alternative 4	
< Spoil Area 1	36,000,000
< SY-200 Yard	12,000,000
• Alternative 5	
< SY-200 Yard	11,000,000

## 8. TDEC Acceptance

State acceptance evaluates whether the state agrees with, opposes, or has no comment on the preferred alternative. The state of Tennessee concurs with the selected remedy.

## 9. Community Acceptance

Community acceptance addresses the issues and concerns the public may have regarding each of the alternatives. The proposed plan presented Alternative 2 as the DOE, EPA, and TDEC preferred alternative. The "Responsiveness Summary" in Part 3 indicates that no comments were submitted during the public comment period.

### **SELECTED REMEDY**

DOE, EPA, and TDEC agree that Alternative 2, the preferred alternative as presented in the proposed plan, is the most appropriate remedy for Spoil Area 1 and the SY-200 Yard in Bear Creek Valley OU 2. This alternative provides the best balance of trade-offs with respect to the CERCLA evaluation criteria. Alternative 2 will allow the proposed future land use of the site to remain consistent with the current use. Restricted industrial land use for OU 2 is appropriate because the land west of OU 2 is designated for disposal and the land east is assigned restricted industrial use. Institutional controls must be maintained indefinitely. The RI risk assessment indicates a current risk to ecological receptors and the potential for future risk to human and ecological receptors. The selected remedy addresses the risk with waste cover maintenance and institutional controls.

This alternative will protect human health and the environment without exposure risk to remediation workers from waste excavation and handling as in Alternatives 4 and 5. Alternative 2 complies with ARARs. This action will not satisfy the statutory preference for remedial actions that use treatment to reduce toxicity, mobility, and volume. Although this alternative provides a lesser degree of long-term effectiveness and permanence, it is the only alternative that does not negatively impact the environment during implementation. Because Alternative 2 does not require disposal, on site or off site, it is significantly more administratively implementable than Alternatives 4 and 5. The effectiveness and implementability of Alternative 2 and 3 are relatively the same; however, Alternative 2 is, by far, the least costly to implement.

Implementation of the selected remedy at Spoil Area 1 is estimated to have a capital cost of about \$5,000. O&M costs are estimated for 30 years at about \$470,000. Based on a 30-year present value, the present-worth cost for Spoil Area 1 is estimated to be \$236,000. The implementation of the selected remedy at the SY-200 Yard is estimated to have a capital cost of about \$18,000 with 30-year O&M costs estimated at about \$540,000. Based on a 30-year present value, the present-worth cost for the SY-200 Yard is estimated to be \$234,000.

### **STATUTORY DETERMINATIONS**

Section 121 of CERCLA establishes several statutory requirements and preferences, including protection of human health and the environment and compliance with ARARs. Statutory requirements also specify that, when complete, the selected remedy must be cost-effective. It must use permanent solutions and innovative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances as their principal element.

There will be no reduction in toxicity, mobility, or volume of contaminants through implementation of the selected remedy because it does not include treatment.

The selected remedy will protect human health by minimizing direct human contact with soil contaminants. This action will result in a decrease in cumulative risk, likely equal to or below the  $1 \times 10^{-6}$  threshold criterion. Risk reduction will be accomplished by periodic maintenance of the existing soil cover and implementation of institutional controls that would limit access and construction and thereby eliminate the exposure pathways (primarily external exposure and inhalation of  $^{226}\text{Ra}$ ). There is no current or significant potential future human health or environmental risk from the seep.

Maintenance of the soil covers will provide a barrier against direct human contact with the buried materials. Institutional controls, such as erecting and maintaining access controls, will serve to prevent unauthorized access to the site, thus limiting the exposure frequency for future industrial workers. Deed restrictions will be placed on the site to preclude future residential and farming use of the areas. Deed restrictions will restrict construction and prohibit waste intrusion. Restrictions will also require the incorporation of indoor radon mitigative measures in accordance with EPA guidelines for any future structure built on site.

The monitoring program to be implemented under the Bear Creek Valley OU ROD will be designed to evaluate migration of contaminants through groundwater and surface water. Any unacceptable contaminant migration in the watershed, based on valley-wide cleanup goals, will be identified and addressed during CERCLA 5-year reviews.

The selected remedy will meet or exceed all ARARs; no waivers are requested. ARARs are listed in Table 2.1 and discussed here.

Chemical-specific requirements set health- or risk-based concentration limits or discharge limitations in various environmental media or indicate a safe level of discharge to be considered (TBC) during remedial actions.

Subpart H of 40 Code of Federal Regulations (CFR) 61 addresses atmospheric radionuclide emissions from DOE facilities and is applicable to any airborne radionuclide emissions at Spoil Area 1. EPA has issued a final National Emission Standard for Hazardous Air Pollutants rule [54 Federal Register (FR) 51654, December 15, 1989] that limits emissions of radionuclides to the ambient air from DOE facilities to amounts that would not cause any member of the public to receive an effective dose equivalent of 10 mrem/year (40 CFR 61.92).

DOE Orders are not promulgated regulations and thus are not considered to be ARARs. They are, however, required at DOE facilities. The radiation exposure limits for the public defined in DOE Order 5400.5, "Radiation Protection of the Public and the Environment," (February 8, 1990) are an effective dose equivalent of 100 mrem/year from all exposure pathways and all DOE sources of radiation. The overriding principle of the DOE Order is that all releases of radioactive material shall be "as low as reasonable achievable." These requirements are TBC guidance for Spoil Area 1.

Performance, design, or other action-specific requirements set controls or restrictions on particular kinds of activities related to the management of hazardous waste (52 FR 32496). Institutional controls will be implemented to limit access, and exposure. There are no federal regulatory requirements specifying institutional controls for CERCLA units. However, the NCP at 40 CFR 300.430(e)(3)(ii) suggests consideration of one or more alternatives that involve little or no treatment, but provide protection of human health and the environment through the use of institutional controls. The preamble to the NCP provides samples of institutional controls, which include land and water use restrictions, well-drilling prohibitions, building permits, and

well use, including land and water use advisories and deed notices (55 FR 3706). In addition, DOE Order 5400.5, Chapter IV, requires administrative (institutional) controls for long-term management in areas containing residual radioactivity above guidance levels. The active controls specified in the Order as well as the NCP may be considered TBC guidance and include land restrictions, fences, and warning signs.

Chapter 1200-1-13-.08(3)(a)4.(iv) of TDEC's final rule, "Inactive Hazardous Substance Site Remedial Action Program," effective February 19, 1994, requires institutional controls whenever a remedial action does not address concentrations of hazardous materials that pose or may pose an unreasonable threat to public health, safety, or the environment or for all areas where containment is a remedial action. The rule stipulates that controls shall include, at a minimum, deed restrictions for sale and use of property and securing the area to prevent human contact with hazardous substances that pose or may pose a threat to human health or safety and would be legally applicable for this alternative.

Chapter 1200-1-7-.04(8) of the Rules of the TDEC lists closure and post-closure standards for Class IV solid waste disposal facilities, including final cover and grading requirements, precipitation run-on/runoff controls, and groundwater monitoring requirements. A compacted soil cover of 0.8 m (30 in.) [0.5-m (18-in.) low permeability layer and 0.3 m (12-in.) protective layer] is required [TDEC 1200-1-7-.04(8)(c)(3)(ii)]. However, if the site-specific closure plan meets the general performance standards of TDEC 1200-1-7-.04(8)(a), the TDEC Office of Solid Waste Management can approve it, allowing alternate closure requirements than those listed in TDEC 1200-1-7-.04(8)(c)(Pugh 1993). After waste disposition ceased in 1985, SA-1 was closed with a 0.6-m (2-ft) minimum vegetative soil cover which is now shown, through the CERCLA risk assessment, to be protective of human health and the environment and meets the general performance standards. Therefore, the specific performance standards are not ARAR for this closure. The general closure performance standards would be legally applicable to SA-1, because it was permitted as a Class IV facility, and are listed in Table 2.1.

Chapter 1200-1-7-.04(8) of the Rules of the TDEC lists closure and post-closure standards for Class II solid waste disposal facilities, including final cover and grading requirements, precipitation run-on/runoff controls, and groundwater monitoring requirements. A compacted soil cover of 0.9 m (36 in.), of which 0.3 m (12 in.) support vegetative cover, is required [TDEC 1200-1-7-.04(8)(c)(3)(i)]. However, as with the Class IV closure requirements discussed above, if a site-specific closure plan meets the general performance standards of TDEC 1200-1-7-.04(8)(a), the TDEC Office of Solid Waste Management can approve it, allowing alternate closure requirements than those listed in TDEC 1200-1-7-.04(8)(c)(Pugh 1993). In 1986, SY-200 Yard was closed with a 1.5-m (5-ft) cap of clean soil which is now shown, through the CERCLA risk assessment, to be protective of human health and the environment and meets the general performance standards. Therefore, the specific performance standards are not ARAR for this closure. The general closure performance standards listed in Table 2.1 would be relevant and appropriate to closure of the unpermitted SY-200 Yard, which handled industrial wastes.

There are no groundwater monitoring requirements that are applicable or relevant and appropriate. There are no location-specific ARARs triggered by the selected remedy for Spoil Area 1 and the SY-200 Yard.

#### **USE OF PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE**

DOE believes the selected remedy represents the maximum practical extent to which permanent solutions can be used in a cost-effective manner for the Bear Creek Valley OU 2. DOE believes the selected remedy provides the best balance of tradeoffs in terms of the nine CERCLA criteria for alternative evaluation. In general, risk reduction provided by treatment is not commensurate with additional costs. Although hazardous and radioactive constituents were

detected at the sites, excavation, transport, and treatment of these constituents may result in negative short-term impacts to the remediation workers and the environment. Waste disturbance may result in contaminant volatilization or migration through fugitive dust emissions. Also, treatment of mercury would only result in contaminant transfer from soil to another medium and not contaminant destruction; therefore, benefits to treatment are minimal. Considering these potential negative impacts, DOE believes the treatment or resource recovery would not be practicable. The selected remedy relies on waste covers and institutional controls to protect human health and the environment without negative impacts to potential receptors.

#### **COST EFFECTIVENESS**

Actions taken under CERCLA must consider the estimated total present-worth costs of the alternatives. Alternatives 2 through 5 in the FS meet the regulatory requirements and reduce risk to human health and the environment to acceptable levels. As shown in Table 2.1, the selected remedy, Alternative 2, is the least costly of the action alternatives. For SY-200 Yard, Alternative 3 is almost two times the cost of the selected remedy for similar degrees of protectiveness. For Spoil Area 1, Alternative 3 is more than four times the cost of the selected remedy. Alternative 4 is approximately 43 times more costly than the selected remedy for Spoil Area 1. For SY-200 Yard Alternatives 4 and 5 range from 17 to 19 times more costly than the selected remedy. Therefore, the selected remedy is the most cost-effective when compared with the other alternatives considered in the FS.

#### **EXPLANATION OF SIGNIFICANT CHANGES**

No significant changes have been made to the remedial action decision selected in the proposed plan through the regulatory and public comment periods.

#### **REFERENCES**

DOE (U.S. Department of Energy). 1995a. Remedial Investigation Report on Bear Creek Valley Operable Unit 2 (Rust Spoil Area, Spoil Area 1, and SY-200 Yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee, DOE/OR/01-1273/V1&D2. Oak Ridge, TN.

DOE. 1995b. Feasibility Study for the Y-12 Bear Creek- Valley Operable Unit 2, Spoil Area 1, SY-200 Yard, and Rust Spoil Area, Oak Ridge, Tennessee, DOE/OR/02-1279&D2. Oak Ridge, TN.

DOE. 1995c. Proposed Plan for the Y-12 Bear Creek Valley Operable Unit 2, Oak Ridge, Tennessee, DOE/OR/02-1338&D2. Oak Ridge, TN.

EPA (U.S. Environmental Protection Agency). 1989. Risk Assessment Guidance for Superfund, Vol. II, Environmental Evaluation Manual, interim final, EPA/540/1089/001. Office of Solid Waste and Emergency Response, Washington, DC.

Pugh, Glen. November 22, 1993. Tennessee Department of Environment and Conservation, Division of Solid Waste Management, personal communication to L. M. Houlberg.

### **PART 3. RESPONSIVENESS SUMMARY**

#### **RESPONSIVENESS SUMMARY**

The public was invited to participate in the determination of the selected remedy described in "Highlights of Community Participation" in Part 2. No public comments were received, and no modifications have been made to the preferred alternative described in the proposed plan.